The background of the slide is a photograph of a tunnel's interior. The tunnel has a corrugated metal lining and several sets of tracks running along the floor. On the right side, there is a speed limit sign with the number '40'. The lighting is dim, with some light reflecting off the tunnel walls.

THE PATH FORWARD: Flood Tunnel

presented by

Brian Gettinger, PE

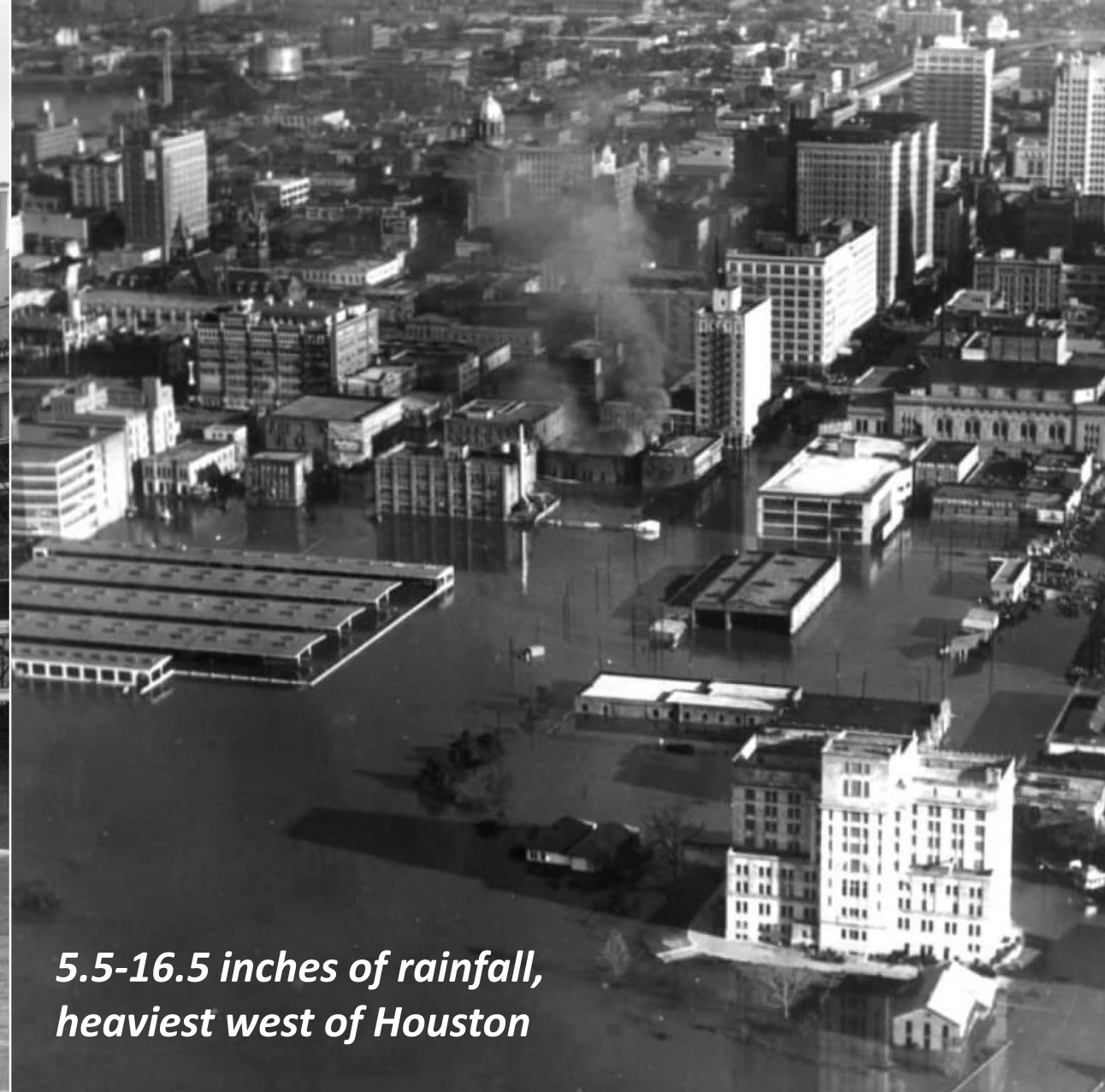


We have to get water to the Bay faster
to prevent flooding

Houston needs more conveyance

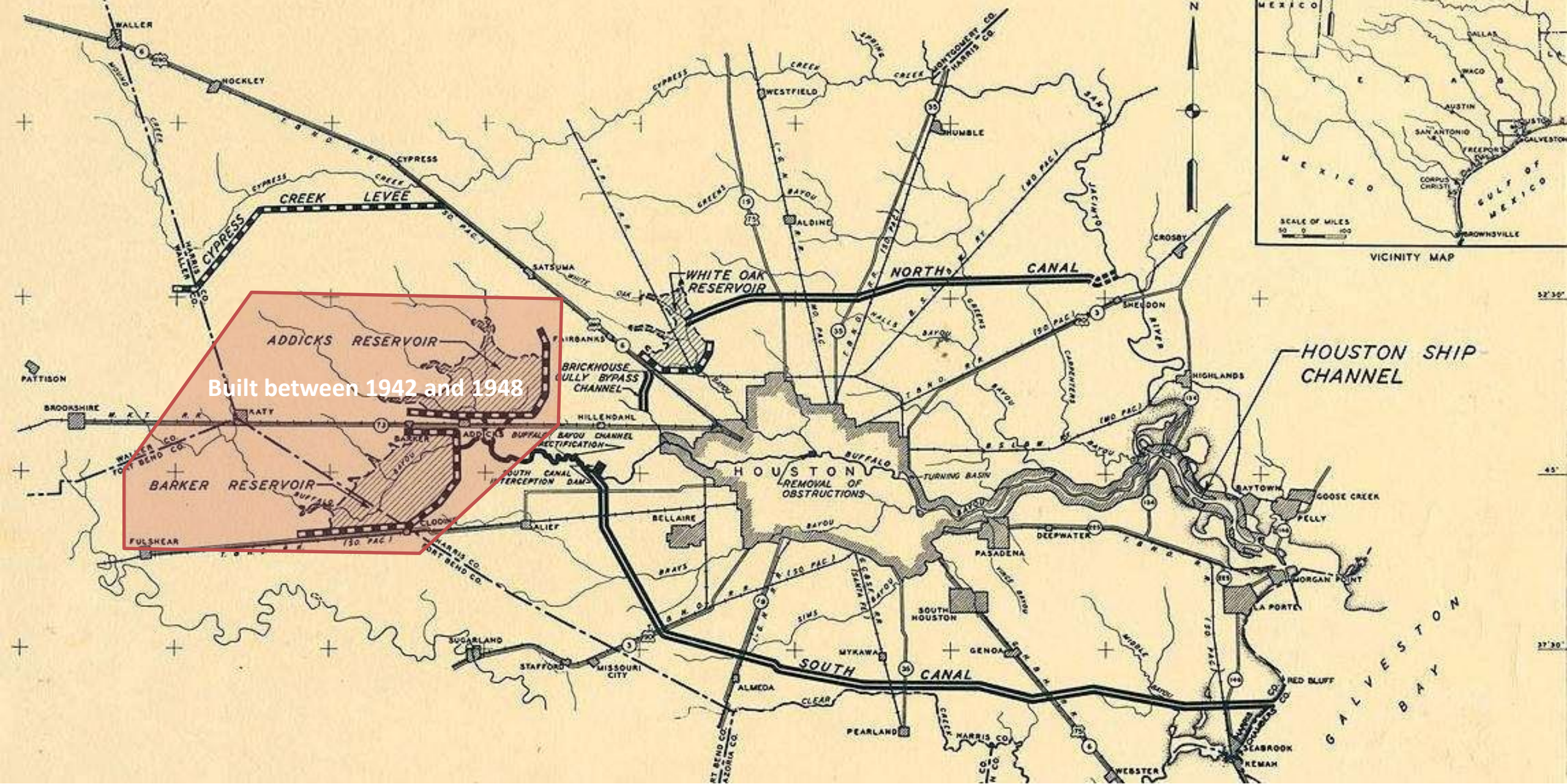


Milam & Congress Street – Downtown Houston



*5.5-16.5 inches of rainfall,
heaviest west of Houston*

Houston 1929 & 1935 Floods



USACE Houston Flood Control Plan ~ 1940



A large, olive-drab military-style truck is driving through deep floodwaters in a residential neighborhood. A soldier in camouflage and a helmet sits on the back of the truck. The water is murky brown and reflects the truck. In the background, there are houses and trees. The scene is overlaid with a quote in green text.

An ounce of prevention is worth a pound of cure
- Benjamin Franklin

Why Now?



Too Expensive

Ground is No Good

Groundwater Table is too High

Never Done it Here Before

Can't Move Enough Water

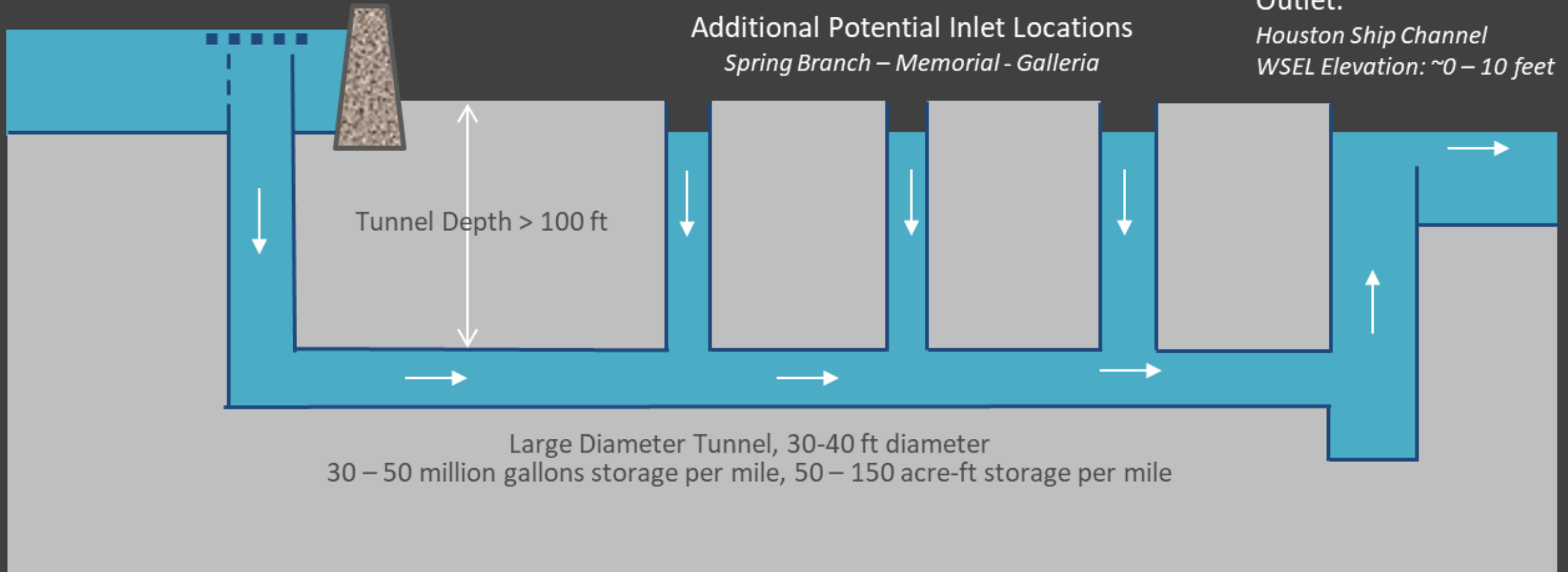
Why Not? Disproving the Myths

Reliable Gravity Flow

Inlet:

Barker Reservoir

Elevation: 95.5 feet (1% Pool) Max 104 feet



How it Works

A large, dimly lit tunnel under construction. The tunnel's interior is lined with corrugated metal segments. On the left, there are large, white, cylindrical structures, possibly part of the tunneling equipment. A person is walking in the distance, providing a sense of scale. The lighting is focused on the path ahead, creating a bright spot at the end of the tunnel.

Key Tunneling Project Drivers:

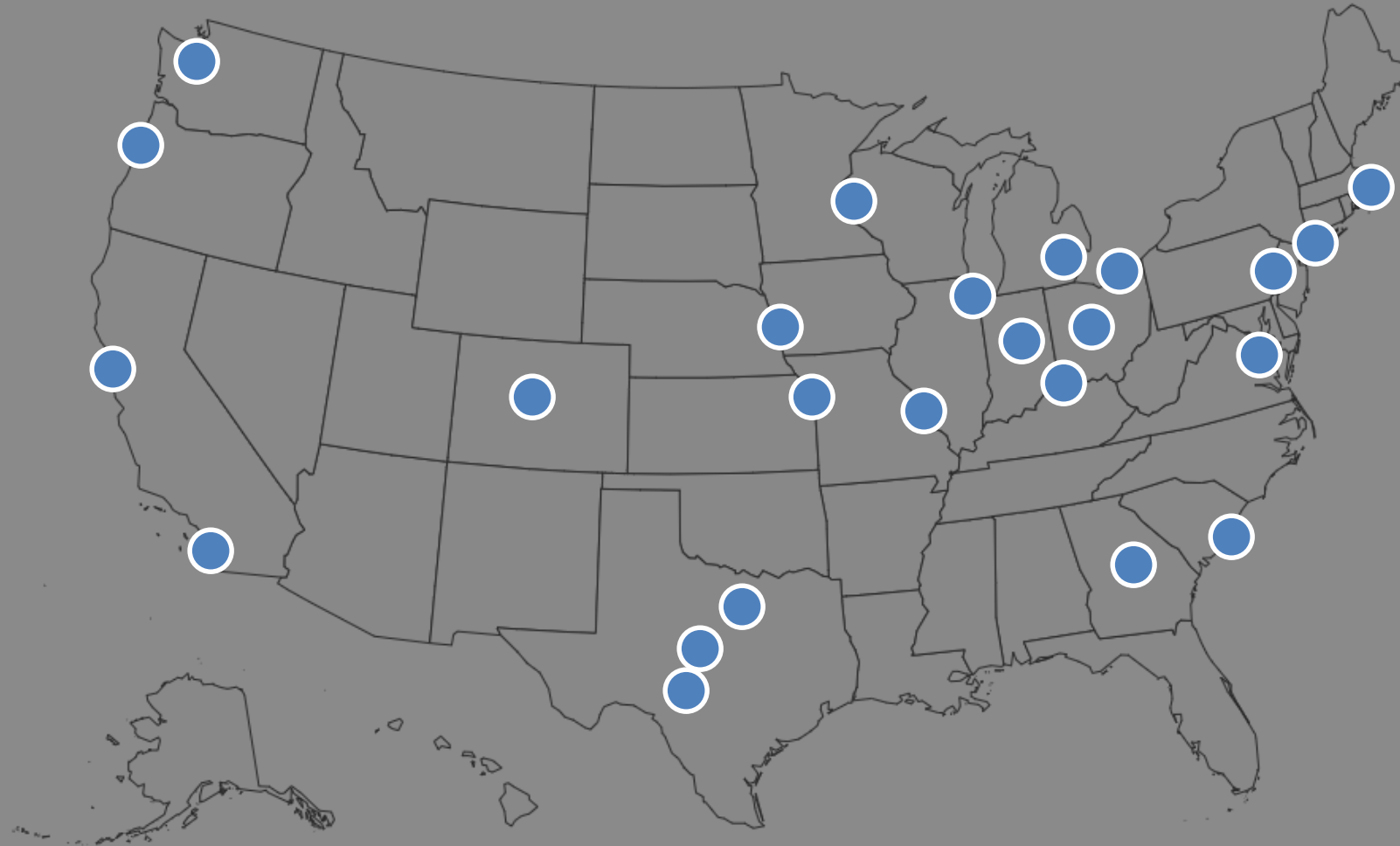
Urban Constraints

Minimize Environmental Impacts

Minimize Community Impacts

Tunnels are the skyscrapers of the underground, allowing higher density infrastructure development in urban areas

Tunneling: The Future is Now

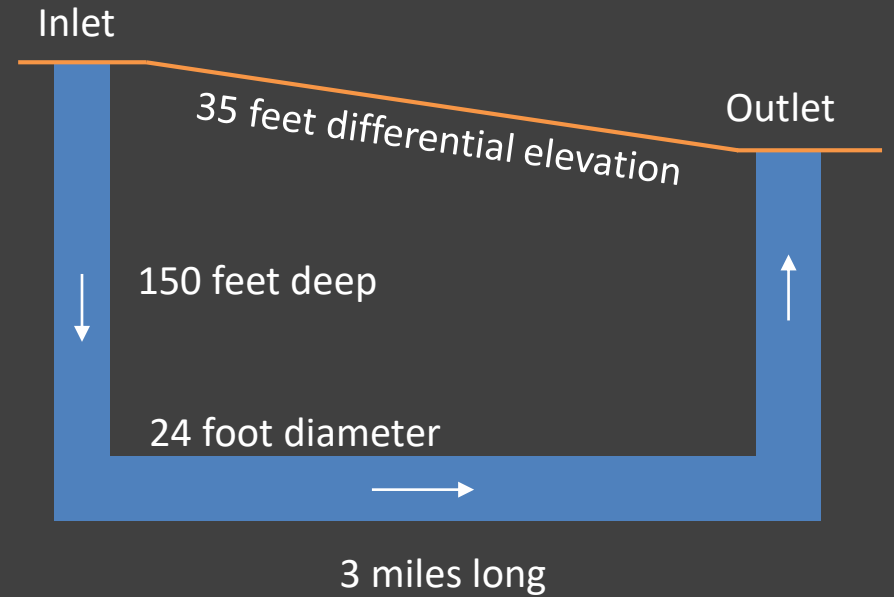
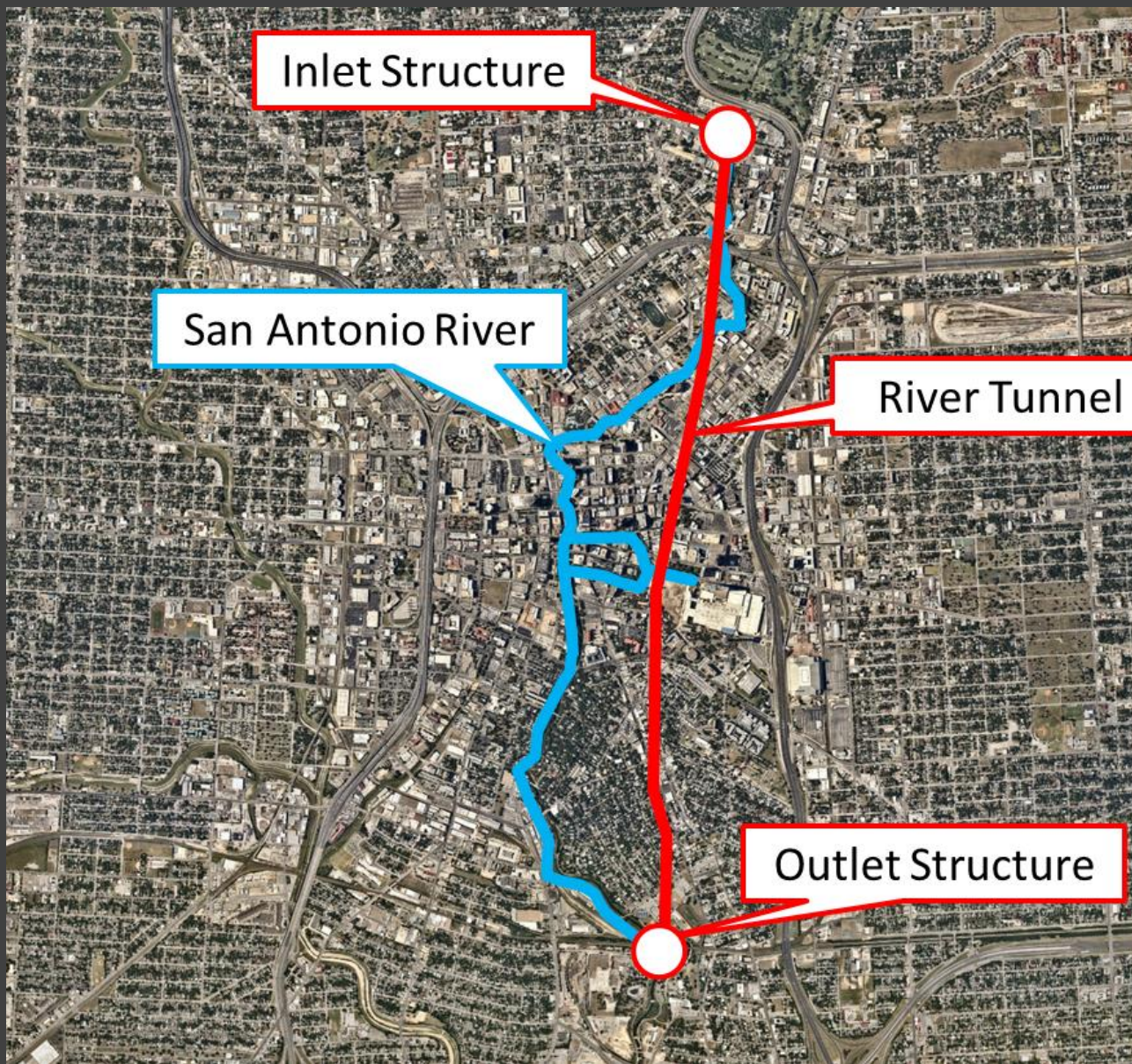


Tunneling is a Proven Solution

Concept in Action



San Antonio River Tunnel



- Built by SARA and USACE in 1997
- 6,700 cfs flow rate

San Antonio River Tunnel



San Antonio River Tunnel - Inlet



San Antonio River Tunnel - Outlet



How is it built?



Major Technological Advances



1985
HERA
20 ft

1996
Sydney
35 ft

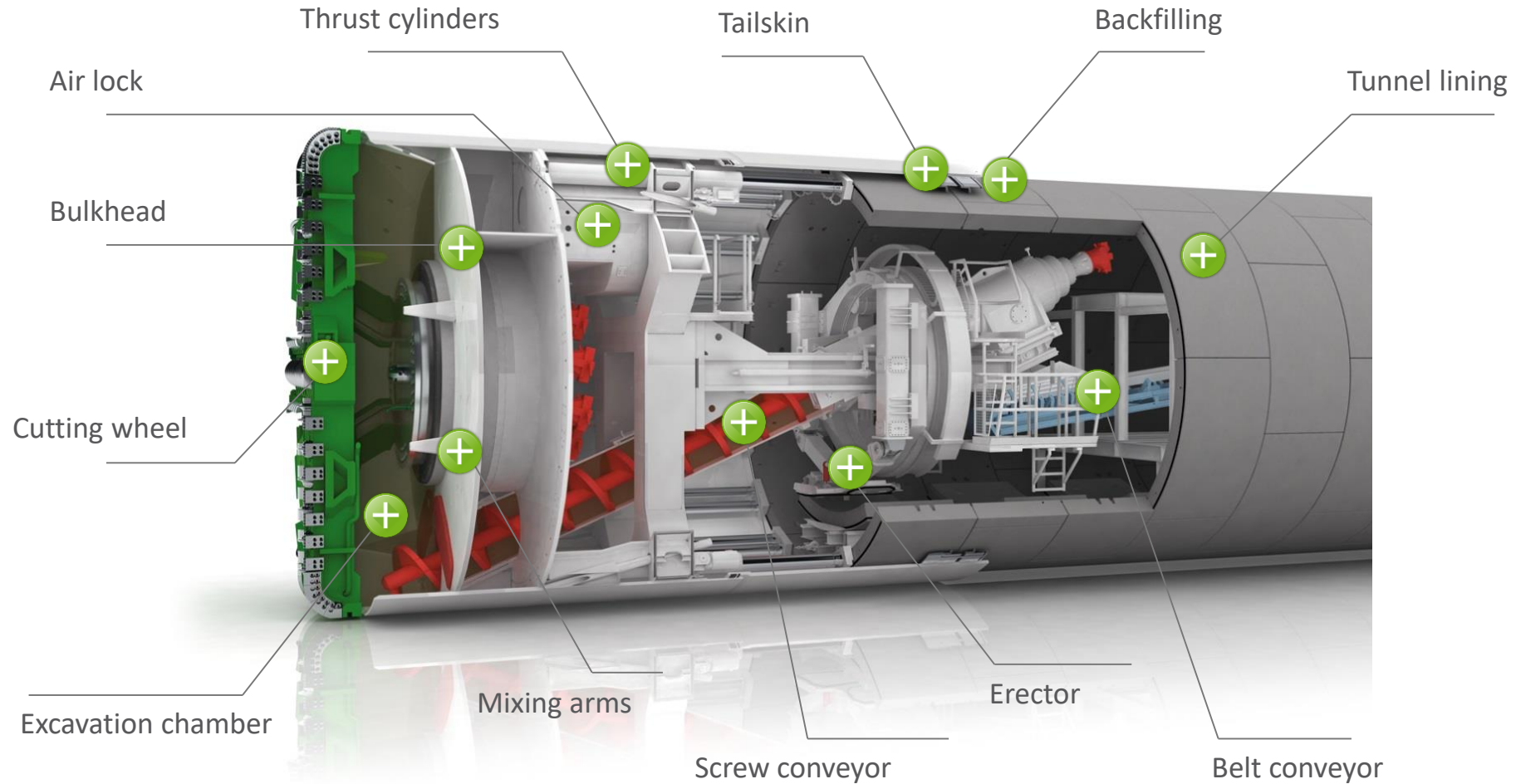
1997
Hamburg
46 ft

2006
Shanghai
50 ft

2013
Hong Kong
57 ft

Significant Technological Advances

State-of-the-Art Excavation Methods



Earth Pressure Balance TBM



Typical Tunnel Shaft



dallas

Mill Creek Tunnel

5 miles long
35 foot diameter
\$206 million



san antonio

San Antonio River Tunnel

3 miles long
24 foot diameter
\$230 million (2018\$)

San Pedro Creek Tunnel

1 mile long
24 foot diameter
\$110 million (2018\$)




austin

Waller Creek Tunnel

1.1 miles long
20-26 foot diameter
\$163 million

What do similar projects cost?



Tunnel Length: 23 miles
Tunnel Diameter - >30 feet
Flow Rate – 10,000-15,000 cfs

Connector Tunnels to Buffalo Bayou
and White Oak Bayou

The **Super Tunnel** Alternative



Buffalo Bayou Channel Section at San Felipe Drive near Voss Road

Harvey – 60.3 feet (>0.2% Storm)

1% Storm Elevation – EL 55.3 feet

10% Storm Elevation – EL 47.5 feet

Normal Water Surface – EL 25 feet

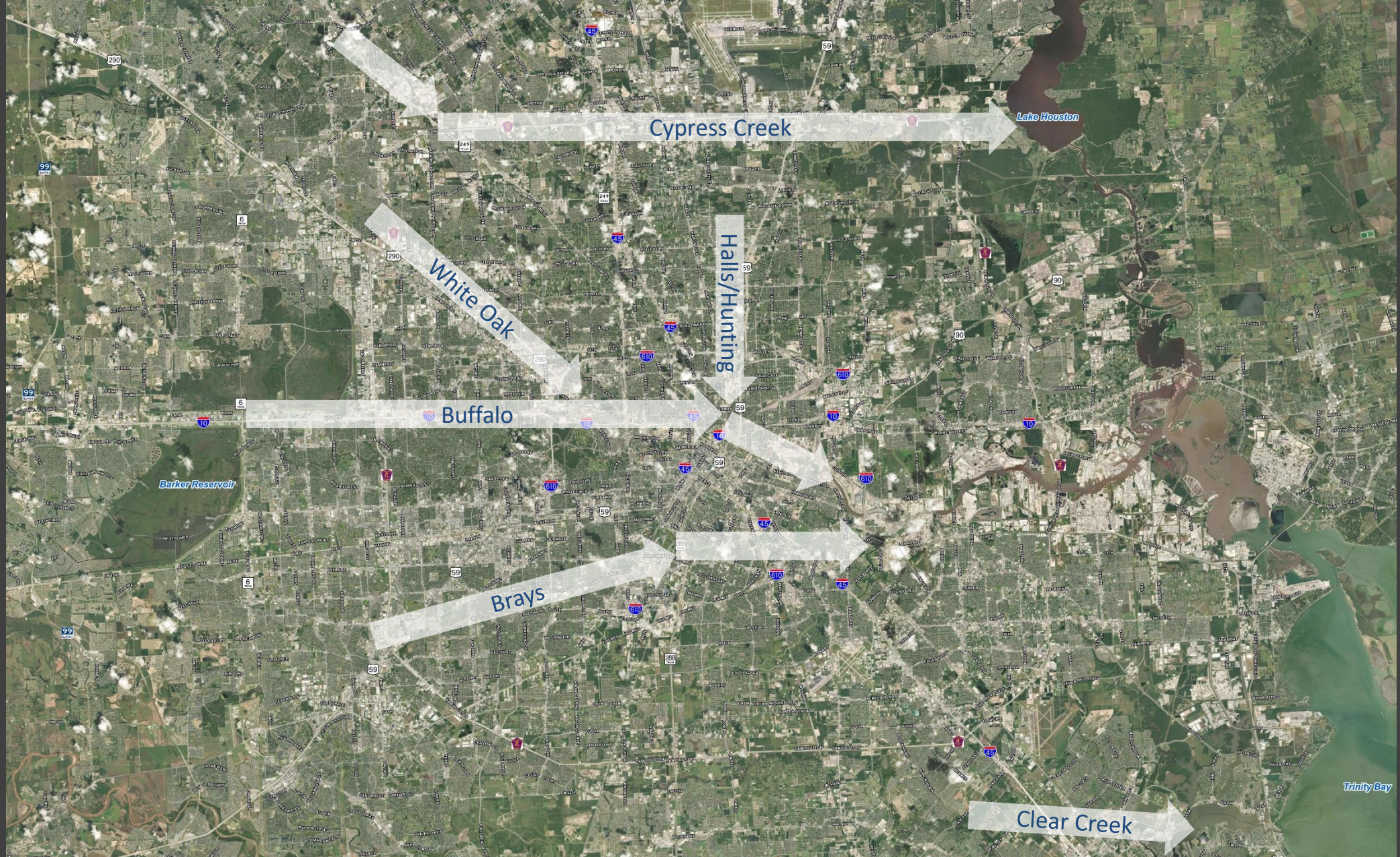
Significant Bank Erosion Potential

More Stable Channel Section

Stream Bottom – EL 21.1 feet

Top of Bank – EL 54.3 feet


Potential Tunnel Intake Elevation



Metro Wide Benefits



There is light at the end of the tunnel



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